

Switching Gears Between Sensory Inputs Is the Primary Instigating Factor in Attention Deficit Disorder - Posterior Parietal Cortex Implicated in both ADD and Distractibility Generally with Consequences for Highway Safety

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Introduction

The neurological mechanisms that determine which individuals are highly distractible and which are highly focused have not been adequately studied, leading to an incomplete understanding of the factors that lead to distraction and why it is that stimulants have an ameliorating effect on distractibility.

The fact that stimulants are effective in reducing distractibility, coupled with important differences in which types of distractions are most distracting relative to which "focus task" points in the direction of the Posterior Parietal Cortex.

Abstract

The phenomenon of a higher rate of car accidents occurring at the outset of rainstorms, of all things, provides an initial lead in investigating the nature of distractibility. It is commonly held that the increased risk of car accidents associated with rain is the result of reduced visibility. While reduced visibility is a factor in this statistical trend, it is merely a tertiary influence on the statistics.

Another commonly held assumption about the increased rate of car accidents during rain events is that petroleum distillates (uncombusted gasoline, for instance) which accumulate on roads during dry periods is liberated by rain, causing roads to become unusually slick. While this, too, has some marginal culpability in certain car accidents, this factor is grossly exaggerated by supposed experts seeking to explain the statistical aberration of dramatically increased car accident risk during the condition of simple rain.

Not explained by supposed highway safety experts is the fact that this risk is highest in the first 15 minutes that individual drivers are on the road in the rain, a fact that creates the illusion that the risk is highest during the first 15 minutes of a rainstorm. If data concerning for how long drivers involved in automobile accidents had been on the road without respect to how long it had been raining, it would be discovered that the reason for the increased risk is a state of neurological distractibility induced by the sensation of having wet skin.

This would point to a mechanism in the Posterior Parietal Cortex that is capable of distracting an individual from their previous focus so as to enable them to focus upon some new sensory input. In certain situations, it is necessary and desirable to do this, but making decisions concerning which distractions should be heeded and which can be safely ignored is a subconsciously-driven autonomic

process that is deficient in ADD patients. As ADD begins to manifest itself during childhood, it stands to reason that a lack of specific types of stimulation results in chronic underdevelopment of the PPC which, in turn, results in the inability of the PPC to intelligently and autonomously disregard sensory distractions based upon pattern recognition. A well-developed PPC may be capable of recalling patterns associated with stimuli one would wish to ignore as well as the ability to learn new patterns that one consciously wishes to ignore on an as-needed basis in order to enhance focus over time when exposed to distracting environments repeatedly over time. In an individual with ADD, the PPC is incapable of learning from history, as it were and therefore relays a "disrupt" signal to other parts of the brain in a knee-jerk reaction to virtually any new stimulus. As with any cognitive deficit, its severity varies depending upon the individual.

A likely culprit in this underdevelopment of the PPC in many children is a trend toward parents too strongly favoring activities for their children that place no demands upon their situational awareness. Some activities, such as reading, while perhaps stimulating in some respects, do nothing to stimulate the PPC for the reason that cozying up with a book places no demands on situational awareness. Video games, on the other hand, depending upon the game in question, require children to track multiple game elements and to maintain situational awareness. Team sports accomplish the same stimulatory effect. Tragically, many so-called authorities have provided the advice to parents that video games "cause" ADD and that reading prevents it, which is the inverse of the truth of the matter. The spike in ADD over the last 30 years correlates directly with the rise in volume-emphasized reading initiatives in American schools.

With this fundamental insight in mind, it becomes clear that the Posterior Parietal Cortex is responsible for making autonomic decisions as to whether to pay attention to a new stimulus or to disregard it. One fundamental assumption that ought to be challenged is that visual distractions are most consequential for a person with ADD when the subject of focus is a visual one. A cliché concerning distraction is imagery of a child watching a teacher making a presentation before a chalk board and, seeing a butterfly floating past a window, leaps from his or her seat to run to the window.

In fact, this sort of distraction is *least* likely to be problematic for a sufferer of ADD. As both the primary area of focus and the distraction are both visual, there is nothing to trigger the PPC to "change gears" to switch to a focus that is, for instance, acoustic or tactile. While the brain is certainly capable of making choices between varying focuses, the strongest distractions, I posit, are those that are conveyed by sensory influences of a different sort from the area of primary engagement. For instance, a person admiring art is much more likely to be distracted by the sound of someone coughing than by a person walking in front of them. For the same reason, a person trying to enjoy music is much more likely to be distracted by flashing lights than by the introduction of additional noise.

Of the five primary senses, it is visual, acoustic and tactile stimuli that the suffer of ADD is incapable of tolerating in combination with one another. ADD sufferers have reported being better able to focus on the plot of a movie if they merely listen to the audio without looking at the video or vice versa. While most people would find a film both less complete and less entertaining when consumed in this manner, for a sufferer of ADD, it may be the only way they can digest the information. This phenomenon further points in the direction of an inability to tolerate sensory inputs of varying types in unison without the PPC repeatedly attempting to "switch gears" when it is inappropriate to do so.

Once a deficit in the PPC has been solidified during early childhood, it may be impossible for normal, healthy function to be restored after the brain has reached a certain stage of development. Importantly, it is not an excess of stimulus that lead to the cognitive deficit that undergirds ADD in the first place. ADD may be prevented by providing enrichment activities to children that emphasize situational awareness and the simultaneous tracking of multiple elements in addition to other activities.

Distraction from visual cues (as in driving) would seem to be strongest with regard to tactile stimulus. Much ado has been made over acoustic distractions to drivers such as listening to music or conversing with a passenger and while those are certainly important distractions to avoid, zero research has been done into the problem of tactile distraction of drivers; a problem that has real-world consequences and a tangible financial impact. While the sensation of raindrops on the skin is highly distracting, the sensation of cold is also highly distracting. Many automobile accidents, as with those associated with drivers having wet skin, are caused by drivers having cold skin. Weather simply being unexpectedly cold even under otherwise perfect weather conditions in which there is no precipitation and no ice on the ground is, contrary to popular belief, a risk factor for automobile accidents. This phenomenon has neither been recognized formally nor has it been studied officially.

Stimulant treatments for ADD (the mode of function of which is supposedly not understood) are highly effective for the reason that these stimulants increase the level of gain of signals originating in the occipital region and force the PPC into a visual focus rather than an acoustic or tactile focus regardless of the situation. This hypothesis also solves the conundrum of why stimulants have the side-effect of helping ADD sufferers to sleep as the stimulant forces their PPC to "tune out" auditory stimulus that would otherwise disrupt sleep and also generates drowsiness by increasing the generation and accumulation of glutamate byproducts associated with intense cognitive activity and which are generated in the greatest quantities as the result of the processing of visual information.

Conclusion

Properly understanding the nature of distraction carries with it not only the opportunity to better-address Attention Deficit Disorder, but to improve highway safety, as well.